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ABSTRACT

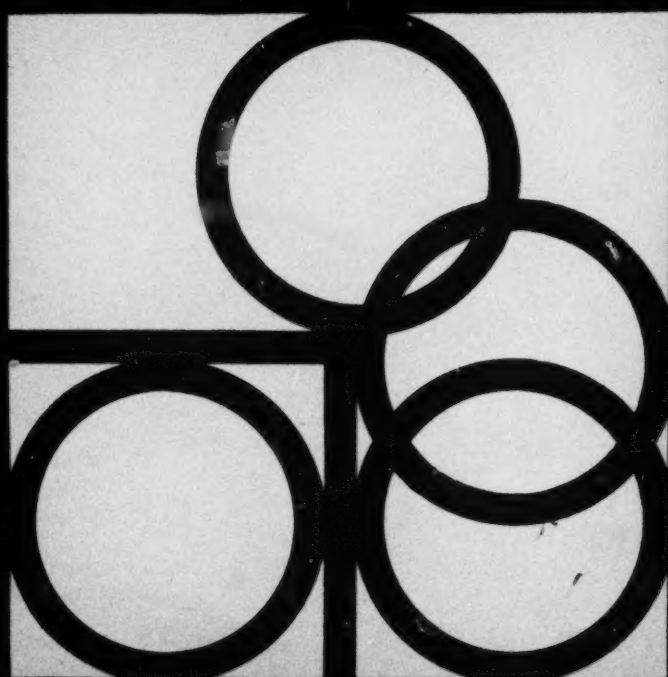
This paper discusses 43 autonomous and semiautonomous centers on The Pennsylvania State University's main campus. It deals with (1) the history and origin of the Penn State centers, and notes that the centers established between 1887 and 1955 generally represented areas in agriculture, engineering and technology, life sciences and the physical and earth sciences, while those established since 1960 have represented the social sciences and the humanities; (2) the functions of the centers, which include: administration and coordination of research, the conduct of research, public service, education and training, and providing supporting services to colleges and/or departments; (3) the differences in functions between the centers and the academic departments; (4) the 3 kinds of structures of the centers: the complete bureaucracies, the truncated bureaucracies, and the enucleated bureaucracies; (5) the organizational maintenance of the centers; (6) the centers' impact on: agriculture, environmental studies, science and technology, public affairs and public service, education, the arts, and services; and (7) some trends and the possible future. (AF)

Centers and Institutes at The Pennsylvania State University

A Case Study

Mary M. Norman

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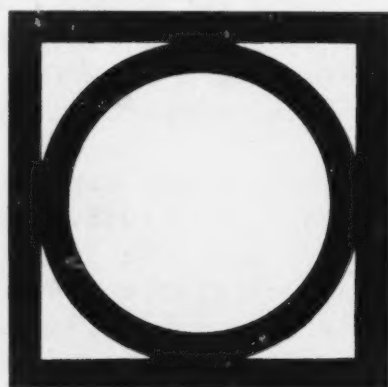
Center for the Study of Higher Education The Pennsylvania State University
Report No. 9

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A Case Study

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Report No. 9

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The Center for the Study of Higher Education at The Pennsylvania State University was authorized by the Board of Trustees in January 1969. Dr. G. Lester Anderson, its director, was appointed the following April. The present staff of the center numbers 23 individuals including four full-time researchers, three visiting researchers and a cadre of advanced graduate students and supporting staff.

The mission of the center is to study higher education as an area of scholarly inquiry and research. Its studies are designed not only to be relevant to the university and the Commonwealth of Pennsylvania, but also to colleges and universities throughout the nation. The immediate focus of the center's research falls into three broad areas--governance, graduate and professional education, and human service occupation programs in two-year colleges.

Research reports, monographs and position papers prepared by staff members of the center are distributed within the university and to other institutions of higher education on a limited basis. Inquiries should be addressed to the Center for the Study of Higher Education, 110 Willard Building, The Pennsylvania State University, University Park, Pennsylvania 16802.

TABLE OF CONTENTS

Introduction and Background	1
History and Origin of Penn State Centers	4
Functions of Penn State's Centers	15
Centers Versus Academic Department	21
Structure of Penn State Centers	24
Organizational Maintenance of Penn State Centers	33
The Impact of Penn State Centers	45
Some Trends and A Look to the Future	55
Bibliography	63

CENTERS AND INSTITUTES AT
THE PENNSYLVANIA STATE UNIVERSITY
A CASE STUDY

Introduction and Background

... I have found a renaissance in Cambridge as I shall try to explain. Like any renaissance it has its special features. It has patrons, its medici [sic], in the faceless U. S. government and the great impersonal foundations; all the changes I have mentioned depend on funds from them. It has a bent for research, as opposed to teaching and for group research at that. Its savants are usually bonded in teams, working on complex projects that cut across the old academic disciplines.¹

Thus Christopher Rand begins a discussion of a comparatively new phenomena on the academic scene, the center or institute. Yet, what do we know of these units? How long have they been with us

¹Christopher Rand, Cambridge USA: Hub of a New World (New York: Oxford University Press, 1964), p. 3.

and what influences led to their establishment? Are their functions restricted to research or do they indeed perform a number of functions? How are they organized or structured? How do they approach problems of authority, autonomy, accountability and academic freedom? Do they resemble academic departments? How are they integrated into the university structure? Will they or have they changed the university structure and functioning? Finally, what is their destiny?

As one examines the literature of higher education, a number of discussions about centers and institutes can be found, for many writers have strong opinions regarding these units. One has only to ask a dean, department chairman or university president about institutes or centers to find a divided academic community. It is also apparent from both a review of the literature and from informal opinion that there is little actual data on institutes and centers.

To examine some of these questions and the related implications for improved functioning of the complex university, the Center for the Study of Higher Education has undertaken a study of these units, sending questionnaires requesting basic data on origin, function, structure and general operations to 51 water resources research institutes and 127 additional institutes and centers in 51 Land Grant universities. This particular study has

been conducted in conjunction with this larger undertaking and is the Center's first case study of a university's system of institutes and centers to be completed.²

Forty-three autonomous or semi-autonomous centers were identified for this investigation on The Pennsylvania State University's main campus at University Park, Pennsylvania. Some may have been overlooked -- one finds a major problem in simply identifying and finding these units.³ Of the 43 centers identified, the author had the opportunity to interview the directors of 38.⁴ The inferences and conclusions discussed in this report are based on these interviews with additional information supplied by the directors, and an interview with Eric Walker, immediate past president of the university. These generalizations do not reflect the opinions or views of the larger university community, including those of deans, department chairmen and other university faculty members.

²Additional university case studies will probably be undertaken in the near future by the Center.

³The original list compiled by the Center contained 52 centers. However, two of these had been disbanded and seven were found not to be centers in terms of the normal conceptions of centers that operate in this study.

⁴Unfortunately, due to scheduling problems, it was not possible to interview all the directors. However, there seems no reason to suspect that the inclusion of the additional centers would change the conclusions of this study.

History and Origin of Penn State Centers

An examination of the Research Centers Directory⁵ reveals that perhaps some 5,000 institutes and centers exist today in American universities, but since this directory does not list all centers and institutes, this figure is no doubt somewhat conservative. Centers are found in almost every discipline and problem area that the university encompasses. The directory supplies information on when these centers were established and by what disciplines.

As one might expect in Land Grant universities, the first institutes or centers were established in the fields of agriculture and engineering, reflecting both the nature and purpose of these institutions and demands placed upon them by society. If one removes agriculture and engineering from the sample, then, as one author has observed, "In the modern sense of organizations devoted primarily to research and organized separately from departments, centers in the natural sciences were first established."⁶ What is also apparent from a study of this directory and from information

⁵Archie M. Palmer ed., Research Centers Directory, (Detroit: Gale Research Company, 1968).

⁶Peter H. Rossi, "Researchers, Scholars and Policy Makers," Daedalus, Fall, 1964, p. 1143.

gathered in the Center's national study to date, is that the growth of centers and institutes has been rapid since World War II. Indeed, over half the existing centers and institutes in this sample have been established since 1950.⁷

The trends and patterns stated above are reflected in the history of institutes and centers at Penn State. Out of a total of 43, only 6 centers or institutes were established prior to World War II (Table I). The first center, of course, was the Pennsylvania Agricultural Experiment Station founded in the late 1880s, followed by the Herbarium in the 1890s. Four other centers were established between 1928 and 1939. These represent the fields of agriculture, engineering, and science exclusively. In 1945, the Ordnance Research Laboratory was established at Penn State and between 1945 and 1955, only four additional centers were created. From this point on, the number of institutes began to grow in number. Of all existing institutes at Penn State, nearly three quarters have been established since 1955. It is also very significant to note that 24, or more than one half, came into being after 1960.

As Table I indicates, those centers established between

⁷Stanley O. Ikenberry, A Profile of Proliferating Institutes: A Study of Selected Characteristics of Institutes and Centers in 51 Land Grant Universities (University Park, Pennsylvania: The Pennsylvania State University, Center for the Study of Higher Education, 1970).

TABLE I

Centers and Institutes at The Pennsylvania State University

<u>Founding Date</u>	<u>Center Name</u>
1880 - 1890	Pennsylvania Agricultural Experiment Station (1887) Herbarium (1890)
1920 - 1930	Earth and Mineral Sciences Experiment Station (1928) Petroleum Refining Laboratory (1929)
1930 - 1940	Regional Pasture Research Laboratory (1935) Pennsylvania Cooperative Wildlife Research Unit (1938)
1940 - 1950	Ordnance Research Laboratory (1945) Institute of Public Safety (1945) Ionosphere Research Laboratory (1948)* Mineral Constitution Laboratory (1948) Dairy Breeding Research Center (1949)
1950 - 1960	Student Affairs Research Program (1955) Nuclear Reactor Facility (1955) Computation Center (1955) Coal Research Section (1956) Field Emission Microscopy Laboratory (1956) Mineral Conservation Section (1956) Shelter Research and Study Program (1959) Institute of Public Administration (1959)
1960 - 1970	Radio Astronomy Observatory (1962) Materials Research Laboratory (1962) Institute for Research on Land and Water Resources (1963) Laboratory for Human Performance Research (1963) Center for Research (1964) Pennsylvania Cooperative Fishery Unit (1964) Computer-Assisted Instruction Laboratory (1964) Institute for Research in Human Resources (1964) International Studies (1964) Laboratory Animal Resources Program (1964) Air Environment Studies (1964) Research on Animal Behavior (1964) Space Science and Engineering Laboratory (1965)* Center for Cooperative Research with Schools (1966) Institute for the Arts and Humanities Studies (1966) Center for the Study of Renaissance and Baroque Art (1966) Mine Drainage Research Section (1967)* Electronic Music Research (1967) Hybrid Computer Laboratory (1968)* Center for Law Enforcement and Corrections (1968) Pennsylvania Transportation and Traffic Safety Center (1968) Institute for Human Development (1969) Center for the Study of Higher Education (1969) Ore Deposits Research Section (1969)*

*The directors of these centers and laboratories were not interviewed, and except for their inclusion in this table these centers are not part of the analysis.

1945 and 1955 fall into the general category of basic and applied sciences, represented in this case by engineering, agriculture, physical and earth sciences. The one possible exception is the Institute of Public Safety. Thus, centers established at Penn State between 1887 and 1955 very largely represented areas in agriculture, engineering and technology, life sciences and the physical and earth sciences. In the period between 1955 and 1960, centers outside these areas began to emerge, including the Student Affairs Research Program and the Institute of Public Administration. Nonetheless, between 1887 and 1960, of the 19 centers established at Penn State, 16 were in the basic and applied sciences.

In the period from 1960 to the present, the pattern changes rather dramatically. Over half of the centers established during the last decade have been in the social sciences and humanities, including the areas of business, economics, transportation, education, government and public affairs. It should be noted that within this grouping, a center in the humanities did not appear until 1966, while all other areas were represented prior to this date.

As Table II indicates, more than half of the 38 institutes and centers are in the sciences. That centers were first established in these areas is not surprising in view of the historic mission

TABLE II

Areas of Concentration of Institutes and Centers at
The Pennsylvania State University*

<u>Area</u>	<u>Number of Institutes</u>
Agriculture	3
Astronomy	1
Conservation	3
Engineering and Technology	5
Life Sciences	3
Mathematics	1
Physical and Earth Sciences	<u>6</u>
Subtotal, Science and Related Fields	22
Business, Economics, Transportation	4
Education	4
Government and Public Affairs	1
Humanities	3
Social Sciences	<u>4</u>
Subtotal, Social Sciences, Humanities and Related Fields	16
TOTAL	38

*The categories are those used in the Research Centers Directory.

of The Pennsylvania State University as a Land Grant university. Since the majority of scientifically oriented institutes have been in existence for some time, it follows that they are larger operations, organizationally more complex than their counterparts in other fields, and financially more secure. This holds true for the newer centers in this category as well. In the case of these newer scientific units, six out of the seven established had comparatively large amounts of federal and/or state funds available to them, which enabled them to create rather extensive units. In addition, the experience gained by a long history of centers in the sciences undoubtedly helped directors in the establishment of newer centers.

In contrast to the institutes in the basic and applied sciences, three-fourths of the centers representing business, economics, transportation, education, government affairs, the humanities and the social sciences were established after 1960. With perhaps three notable exceptions, namely two transportation centers and one social science center, these centers are relatively small operations that receive a modest proportion of their funding from federal or state agencies. Indeed, even the largest centers in this grouping cannot be compared in any significant way with the Materials Research Laboratory or the Ordnance Research Laboratory. (There are of course many reasons, other than

historical, which have caused centers to develop in a particular manner. These will be discussed below.)

A variety of influences have been responsible for the establishment of centers at Penn State. These influences can be placed in three categories: (1) influences from outside the university; (2) initiatives from the administration of the university; and (3) work by a faculty member, who can be characterized as an influential academic entrepreneur. Strong among those influences from outside the university are federal and state legislation directly establishing centers, and monies available from federal, state and other agencies for specific task-oriented research purposes. Also in evidence are forces representing special interest groups outside of government.

Of the 38 institutes, 3 were established as a direct result of federal legislation. These are the Pennsylvania Agricultural Experimental Station, the Regional Pasture Research Laboratory and the Water Resources Center in the Institute for Research on Land and Water Resources. The availability of federal monies has also been partially responsible for the establishment of still other centers such as the Ordnance Research Laboratory, the Shelter Research and Study Program, the Materials Research Laboratory and the Center for Cooperative Research with Schools.

Monies from the Commonwealth of Pennsylvania have been

partially responsible for establishing such centers as the Pennsylvania Cooperative Wildlife Research Unit, the Coal Research Section, the Air Environment Studies group and the Center for Law Enforcement and Corrections.

In addition, the Pennsylvania petroleum industries were influential in the establishment of the Petroleum Refining Laboratory; the dairy industry in the Dairy Breeding Research Center; and the Pennsylvania Bureau of Sportsmen and the Pennsylvania Bureau of Fisheries in the Pennsylvania Cooperative Fishery Unit. It is clear that the federal and state governments and various agencies have been very influential in bringing about the establishment of centers at Penn State.

Influences from the administration of the university have also been responsible for establishing centers. A member of the central administration, a college dean or a department chairman may have been primarily responsible for creating a center in a certain area. Examples of centers where the central administration played a leading role include the Institute of Public Safety, the Nuclear Reactor Facility, the Computation Center, International Studies program and the Center for the Study of Higher Education. College administrators were influential in establishing centers such as the Institute for Human Development, the Earth and Mineral Sciences Experiment Station, the Institute of Public Administration

and the Center for Research in the College of Business. Departments have taken the lead in establishing a center for Research on Animal Behavior, the Center for the Study of Renaissance and Baroque Art, and an Electronic Music Research group.

A third major force for the establishment of centers has been the influence of strong faculty members, who have been instrumental in establishing many of the previously mentioned units such as the Field Emission Microscopy Laboratory and the Institute for Research in Human Resources. The academic entrepreneur is found at Penn State in almost every department or college, although the areas of basic and applied sciences may have more than their share. These individuals tend to be full professors, with an established academic "track record" in organized research. These are men of national reputation gained through their own research and publications, who have been successful in obtaining outside funds for their research. As one author has observed, "The professor in our time is becoming an entrepreneur. This used to be the role of the president. Kerr suggests that the power of the individual faculty member is going up and the power of the collective faculty is going down because the professor has direct ties to major sources of funds and influence. It is his presence that attracts resources."⁸

⁸Burton Clark, "Faculty Organization and Authority," in Professionalization, ed. by Vollmer and Mills (Englewood Cliffs: Prentice Hall, 1966), p. 289.

What causes the individual faculty member to press for the establishment of an institute or center? The answers to this question were perhaps best summarized by the director of one of the rather large centers, who explained that he was interested in research in a particular area and had received large funds to conduct this research; that his research was task-oriented and required the skills and knowledge of other disciplines; and that because his academic department was discipline-oriented and interested in publication but not research, he believed he had to go outside the academic department to accomplish his stated tasks. This rationale was not unique to this individual, but was repeated in various ways by many research directors. One might also hypothesize that underlying this rationale is a strong desire on the part of these individuals to obtain positions of authority within the university.

All three influences -- outside organizations, administration, and faculty -- have come into play in the founding of centers and institutes at Penn State. In the earlier period, that is from 1887 to 1945, the centers established at Penn State were overwhelmingly a direct result of outside influences. The chief outside influence during this period was federal and state legislation enacted to establish centers in universities. The university responded positively to these units, not only because they strengthened the research function of the university, provided

monies for graduate training and in general brought other funds into the university.

After World War II, the patterns of influence began to change. During this period between 1945 and 1960, the central administration of the university took the lead in the establishment of centers and institutes. To be sure, some colleges initiated centers during this period but the central administration played the dominant role. Actually, a tangled interaction of forces was at work at this time, for the administration was aware that the federal government, state government or some foundations had monies available for the research or service they were contemplating. What is equally apparent is that both the government and the administration felt that to fulfill new functions, separate units needed to be established. As indicated previously, the vast majority of institutes founded during this period were in the sciences.

During the period from 1960 to the present time, the patterns seem to change again. Although outside influences and the central administration continued to play a role, their roles were less significant than during the previous periods. The centers created now were more often established by the impetus generated from a college dean, department chairman or an individual faculty member than from the central administration. The changes here seem significant, for they reflect the growth and development of colleges

and departments to the extent that they submitted proposals to the central administration for establishment of such centers where the previous period reflected a reverse process.

Functions of Penn State's Centers

If one had the interest and inclination, one could on any day gather information on the state of pasture lands in Pennsylvania, the sun, the Pennsylvania economy, air and water pollution, Pennsylvania's fiscal affairs, higher education, transportation, and renaissance and baroque art. If one were still further inclined, one might avail one's self of services from a nuclear reactor, a computation center, a public safety unit or indeed could be supplied with laboratory animals for one's research. Such is the wide range and rich variety of activities performed by Penn State's centers and institutes.

Within these centers, various tasks may be performed including: 1) administration and coordination of research; 2) conduct of research; 3) public service; 4) education and training; and 5) supporting service to colleges and departments. An institute may perform all, some or merely one of the above functions.

Administration and Coordination of Research

The primary functions of the centers in this category are to request, approve, fund, or seek funds for various research projects

submitted to them by faculty members who are not on the permanent staff of the center. These centers may also have some responsibility for the supervision of funded projects and may also publish research results. The Center for Research, established by the College of Business, is an excellent example of a unit primarily engaged in the administration and coordination of research. This institute is the result of an attempt on the part of the College of Business to centralize its research activity. Although the director of this unit and his staff engage in research activities of their own, their main functions are to: 1) aid individual faculty members in securing support for their research projects; 2) screen and give advice on specific research proposals; 3) provide centralized technical and clerical support for research projects; and 4) generally give visibility to the research function of the college.

Conduct of Research

In contrast to this unit, one of the numerous examples of a center primarily engaged in the conduct of research is the Laboratory for Human Performance Research. Established to conduct research in the specific area of human performance, this unit has a permanent staff of professionals along with extensive facilities. The center staff decide on what projects to undertake, and research results are published by the center.

Public Service

A good example of an institute engaged primarily in the public service function is the Institute of Public Safety. This institute provides educational services to Pennsylvania citizens, its schools, to traffic police, to its truck and bus transportation businesses, and to its industries through practical courses, conferences, and research activities in the broad field of traffic safety, fleet supervision and management training, and control of drivers. Indeed, this center conducts programs throughout this nation and Canada, and thus provides a great public service in the whole transportation safety area.

Education and Training

Although it is difficult to choose a center in the sample that is primarily engaged in education and training, the Radio Astronomy Observatory comes the closest to this type of center. Although research is conducted by this unit, its chief goal or mission is the education and training of graduate students. In fact it is difficult to make a clear-cut distinction between the functions of this unit and the functions of the astronomy department.

Supporting Service to Colleges and Departments

Finally, a very good example of a center that provides services to colleges and departments is the Computation Center.

Indeed, the sole function of this unit is to provide services to the total university community.

Although the 38 centers at Penn State perform a wide range of functions, as Table III indicates, almost two-thirds of them are engaged primarily in research. Yet, this is only their primary function, and they do, for the most part, perform other tasks. Only seven centers could be identified that were engaged in research as a sole function. Nine of the units engaged in the education and training of graduate students in addition to their research function, and the remaining five provided either public services or services to departments and colleges as well as conducted research. Those institutes engaged primarily in the administration and coordination of research, public service, and education and training also have a variety of secondary functions. However, those centers engaged in providing services to colleges and departments appear to have this as their exclusive function. It is also significant that no center was found that performed all the functions identified.

It is apparent that within any particular function there exists still further divisions. Although the majority of the centers studied were engaged in "research," this function differs from institute to institute. In many institutes, "research" means task-oriented problem-solving research. In a few cases, this

TABLE III

Primary Functions Performed by
The Pennsylvania State University Centers

<u>Functions</u>	<u>Number of Centers</u>
Administration and Coordination of Research	8
Conduct Research	21
Public Service	2
Education and Training	2
Supporting Service to Colleges and/or Departments	<u>5</u>
TOTAL	38

function demands the expertise of many disciplines and requires a large organization and extraordinary physical facilities. At the other end of the spectrum is the department-wide or college-wide institute or center with a very small staff, which engages in research but is primarily responsible in aiding other faculty to obtain funding for their research. In a real sense, these units are set up to insure that research is undertaken in a particular department or college. Between these two extremes there are numerous ways in which institutes and centers carry out this particular function. Of course, the same can be said for the other functions that have been identified. Institutes primarily designed to provide services, may require elaborate facilities and provide services to the total university and to various segments of the society. On the other hand, there are service units such as specialized laboratories that provide these specialized services only to a particular college or department. Those centers engaged in administering and coordinating research also display a variety of functioning patterns. At one end of the spectrum, a center may have direct responsibility for supervising research and at the other end can be found a center that might be called a "paper" organization, or a center that merely solicits and receives funds for research and then in turn authorizes grants to individual faculty members, but does not become involved after

making the grant.

Center Versus Academic Department

In this study of centers it was found that the functions carried out by these units tended to be different from the functions of the typical academic department. The primary difference, of course, occurs in relation to the teaching function. The major function of most academic departments has been and still is instruction. Although academic departments are engaged in research, it usually is individual rather than group research, and it does not resemble the task-oriented research undertaken by centers. Although some academic departments do provide services to the university and even to constituencies outside the university, few academic departments are dedicated to providing services as a primary function. In addition, it was found that a majority of centers and institutes employ many professionals on a part-time basis. This is in sharp contrast to a department in which the vast majority of academicians are full-time employees. Similarly, the majority of centers at Penn State are supported entirely or partially by outside funding.

Where centers seemed to be significantly different from academic departments was in their ability to narrow their functions--to concentrate their efforts on one or two very well-defined functions. As one center director stated: "We are

unlike academic departments because we do not try to be all things to all people, but we concentrate our efforts in a particular area and thus achieve different and perhaps more tangible results." Indeed, most center directors pointed to this "narrowness" of function as the primary difference between their centers and the academic department.

It should be mentioned that this narrowness of function was not always of the center directors' own choosing. Often because of university policy restrictions and/or grant restrictions, a center must maintain this narrowness of function. The directors, however, see the narrowing of functions as one of the important features of a center. In interviews with center directors, all pointed to one or more of the following advantages accruing from this general feature. Since centers were organized for a specific purpose or purposes, whether it be research or service or various combinations of functions, the center staff was able to concentrate its efforts in one particular area. Centers were also in a position to attract individuals who wished to devote full- or part-time to a particular research project. Some centers offered faculty members the opportunity to work on a particular problem with colleagues from many disciplines. Still other centers enabled faculty to work with individuals from various specialties within their own disciplines. Not only could centers attract

these individuals, but they could usually offer them research facilities, as well as support for graduate students, secretarial help and other services frequently not available in an academic department.

Due to the fact that centers have defined areas of concentration, many have connections on the federal and state level, and thus can attract funds that would be impossible for an individual or a single department. And apparently because these funds, as well as university funds, are usually granted for specific purposes or projects, these centers were found to have well-planned and well thoughtout programs that make good use of available resources.

In summary, then, centers perform functions different from those of an academic department and there seems to be a number of functional advantages in centers. However, what is equally significant is that three-quarters of the center directors as well as Dr. Eric Walker, past president of the university, believed that the functions of centers could be conducted by an academic department. They all agreed, however, that departments were reluctant or seemingly incapable of undertaking these functions at the present time because of the way they were structured. Thus, it would seem until the academic departments modify their structures, centers will continue to fulfill functions not performed anywhere

else in the university. This situation is perhaps best characterized by Paul Dressel and his collaborators:

Yet the institute proliferates, in great part, because of the fallibility of traditional academic departments whose instructional and research activities are tied tightly to the disciplines which justify their existence. Academic departments typically have neither the resources nor the interest to attack problems transcending their disciplines; faculty members are uncomfortable when asked to operate outside the theoretical constructs with which they are most familiar. ...Thus, when funds become available in problem areas not previously established as being of university concerns -- often the university is plotted into new concerns -- the institute provides a natural vehicle for assembling staff, attracting more funds, indicating institutional commitment, and determining responsibility and accountability of resources.⁹

Structure of Penn State Centers

The functions performed by institutes and centers have called forth a variety of organizational structures. The concern here is

⁹Paul Dressel, Craig Johnson, and Phillip Marcus, "The Proliferating Institutes," Change (July-August, 1969), 23.

with identifying the relationships between the functions performed by institutes and the particular structures adopted by these units to achieve these functions. Although there are many theories of formal organizations, three organizational patterns described by Becker and Gordon¹⁰ have been used here: 1) complete bureaucracies, 2) truncated bureaucracies and 3) enucleated bureaucracies. A complete bureaucracy is one in which the full managerial hierarchy and the resources necessary for task performance are maintained by the organization. A truncated bureaucracy is one in which the lower managerial levels and some of the potentially needed resources are not stored within the organization until the specific nature of the task is known. An enucleated bureaucracy is one in which the organization is in essence assembled on demand on an ad hoc basis. Certainly, these are ideal types, but they have proven quite useful in this attempt to describe and understand the structure of institutes and the relationship between structure and function.

In fact, the three organization types represent points along

¹⁰Selwyn W. Becker and Gerald Gordon, "An Entrepreneurial Theory of Formal Organizations," Administrative Science Quarterly (1967), 315-344.

a continuum. The criteria that the authors suggest and which have been employed in designating a center as resembling a certain type are based on the degree to which resources (men, equipment, budget and space) are stored specifically within the center. In other words, what is the degree of availability and stability in manpower, internal organizational structure (sections, departments and offices), funding, control of resources and control over rewards and sanctions? To what degree are procedures organizationally specified--that is, what is the degree of stability in the goals, programs and procedures of the center? A complete bureaucracy would display a high degree of stability in means and ends, whereas by contrast, the enucleated structure would have much more variation in goals, procedures and resources -- especially human resources.

In order to provide a better picture of how these centers differ and how their structures are closely related to their functions the activities of three units that seem to best exemplify these models are outlined.

Center No. 1 -- A Complete Bureaucracy

The Materials Research Laboratory was founded in 1962. The major function of this unit is to conduct research in materials science and engineering. Over the years, it has provided the venue for the education and training in research of many graduate

students, including a large number of Ph.D. candidates who have received their degrees in various departments and in the inter-college graduate program in solid state sciences. The laboratory was founded in response to the changing nature of science and engineering which demanded an approach that was not possible within the confines of discipline-oriented departments. The influence of the federal government, which made it known to universities that the government was interested in funding interdisciplinary research on materials, was also crucial. Professor Rustum Roy, the present director, also played an important role in the founding of this laboratory.

The federal government through various agencies supplies 80 percent of the financial resources for this operation, which has an annual budget just below a million and a half dollars. The laboratory has a full-time staff of 32 individuals at the rank of research associate or above. In addition, there are approximately seven faculty members who work part-time with this unit, and in any one year this unit has anywhere from 40 to 90 graduate assistants in its employ. The laboratory's science management theory calls for a single level of administration only. There is a director and there are two staff associate directors. Maximum formal efforts are made toward engendering cooperative research within the faculty, both of the laboratory

and outside. All staff members with professorial rank hold joint appointments in academic departments. Although the core faculty expend most of their professional energies within the center and help define its direction and character, all teach in their respective departments, many carrying loads as large as their colleagues affiliated only with a department. Resources, both material and human, are maintained by the organization. The faculty receive salary increases, and are promoted through the laboratory director in concurrence with the respective department heads. Postdoctoral research associates on temporary appointments have no department affiliations. Their salaries are regulated by the laboratory itself, within the framework of guidelines laid down by the university. It is important to note that the research conducted by this unit requires extensive and expensive equipment which cannot be made available to individuals. A modern facility was erected with the aid of federal funds to house the total operation of the organization. The director has specifically organized this unit along lines described above in order to fulfill the stated purposes of the center, which have remained reasonably stable for a decade. While Penn State was among the first, between 50 to 100 universities have since organized some interdisciplinary units related to "materials."

Center No. 2 -- A Truncated Bureaucracy

The Center for Cooperative Research with Schools is housed within the College of Education and is in its fourth year of operation. Although the College of Education has long had cooperative arrangements with high schools throughout the state, the idea to establish a center was not considered until federal funds became available to support research in this area.

Prior to a year ago, the main functions of the center were service to the high schools and the establishment of a field base for research. This changed, however, with the emphasis switching to research as a primary function and service as a corollary or secondary function. This alteration in function is a direct result of a five-year program initiated by Dr. Kohl, the present director, which focuses in on curriculum research. It is concerned with how technology, mainly computers, affects the curriculum and how teachers interact with computers.

In contrast to the Materials Research Laboratory, the majority of personnel of this center serve only part-time with the center and maintain their identification with departments. The director has an associate and a number of clerical employees. There are five to seven professionals who work for the center on a part-time basis mostly in the field conducting various aspects of research in accordance with plans developed by the

center. The structure of this unit is appropriate to its functions, for it is flexible enough to allow the director to select and attract professionals from within his college who are interested in conducting research in priority areas as defined by the center. Thus, because of the changing nature of the specific research function and changes in the amount of financial resources available, it is not possible to maintain a permanent full-time and highly stable staff.

Center No. 3 -- Enucleated Bureaucracy

A center in the sample that might be typed as an enucleated bureaucracy is the Center for the Study of Renaissance and Baroque Art. It was founded in 1966 by Dr. Weisman, who is the center director as well as chairman of the department of the same name. In order to attract experts in the field of renaissance and baroque art to Penn State, Dr. Weisman felt it necessary to establish a center that would enable the department to set aside research funds in a systematic fashion. Most of the experts in this field are in Europe, and thus to attract them to Penn State for research and teaching, a "center" seemed useful.

The chief function of this "center" is to promote research and scholarship in this area. The program is tied in very closely with that of the instructional program of the Department of Renaissance and Baroque Art. The individuals brought to campus

conduct research three-fourths of their time and instruct students the remaining one-fourth. In a real sense, this "center" has little task stability or resource permanence in any of the areas previously outlined. Tasks vary with the professor. The organization is assembled on an ad hoc basis to fulfill the functions of a given period in time. While the general goals may remain the same, the specific mission, procedures, staff and equipment may change markedly from time to time.

Out of the sample of 38 centers at Penn State, 13 resemble complete bureaucracies. Four of the 13 are service organizations and 9 have as their primary function the conduct of research. Among the service units are the Nuclear Reactor Facility and the Computation Center. Their services are predictable and in order to maintain them, the centers have full-time, continuing staffs and a stable system of management. With some minor uncertainties, they can also predict and count on the financial resources necessary to fulfill their stated functions.

Centers engaged in the conduct of research with a structure that more or less resembles a complete bureaucracy include the Regional Pasture Research Laboratory, Ordnance Research Laboratory, Student Affairs Research Program, Institute of Public Administration, Materials Research Laboratory, the Laboratory for Human Performance Research, the Dairy Breeding Research Laboratory, the Air Environ-

ment Studies group and the Center for the Study of Higher Education. As one looks over this list, these units appear to share a number of common characteristics. With the exception of the Student Affairs Research unit, these centers represent some of the larger ones in the university. They spend comparatively large amounts of money, ranging anywhere from close to a million to over eight million dollars per year, from sources both within and without the university. All of these units are engaged in task-oriented or problem-solving research, and with few exceptions, this research demands fairly extensive facilities.

Of the remaining units, 22 can be identified as truncated bureaucracies -- 10 of these falling somewhere between the complete bureaucratic model and the truncated -- and 3 units resemble an enucleated structure. Thus, it appears that most centers and institutes at Penn State have chosen a fairly stable type of format and can be considered permanent organizations. It is also significant that the majority of the organizations studied can be typed as truncated bureaucracies, for this has a direct relationship to the functions of these institutes. As discussed earlier many of them employ faculty on a part-time basis to conduct research in a given area or to provide a particular service for a given period of time. Most of the institutes have rather small central staffs -- a nucleus -- and yet employ and support large

numbers of faculty in many cases from a number of disciplines. In addition, much of the research or other activities required by these units do not demand centralized or extensive facilities and these units can contract out to faculty members to conduct research from their own departments. These centers, then, best fulfill their functions by maintaining a small managerial hierarchy of their own to coordinate most of the resources -- this sometimes can be as few as one or two individuals but can go as high as 10 or 20 -- with most of the actual "work" of the institute being done by individuals who are not a permanent part of the unit. In almost every case, it was found that since financial resources are maintained and controlled by the unit, it was in the area of human resources that these centers took on a truncated nature.

Organizational Maintenance of Penn State Centers

As with any unit, centers and institutes must solve problems of organizational maintenance that often present a series of dilemmas. How can a center director maintain responsibility for planning his center's program and at the same time accommodate the wishes and interests of staff members, academic departments and funding agencies? How does a center attract and hold professional staff when control over academic promotion and tenure is exercised only by academic departments? How do centers account for their activities within the university structure and still protect their autonomy, and how does

this compare with the way in which academic departments face this dilemma? What determines where a center is placed in the organizational pattern of the university, and what effect does this placement have on the centers' relationships with departments and colleges within the university? Although the centers in this study approached these problems in a variety of ways, an examination revealed discernible patterns of conflict resolution among them.

It was apparent from the investigation of the various structural forms adopted by Penn State centers that a good deal of authority is vested either within the center director or the center staff to determine what projects will be undertaken and how they will be conducted. However, since the majority of centers are engaged in research and the research conducted is task-oriented, faculty members employed full- or part-time in a center must, on occasion, sublimate their own desires to the task to be accomplished. In an effort to accommodate faculty members and to insure their academic freedom, directors employ a variety of methods. One such method used by directors is a selection process. Some directors indicated that they employed only those individuals who well understood what their roles in the center would be. At the time of employment, these directors indicated to the individual that he was being employed because of the particular expertise

he could bring to a predetermined task or project. Thus, by establishing job descriptions and hiring individuals to fit these positions, some of the problems of accommodation are alleviated or avoided.

Still other directors coped with the problem through a policy of staff initiative. They indicated that much of the research undertaken by their centers was the direct result of proposals submitted by their full-time or part-time professionals. This mode of operation enabled staff members to work on projects most interesting to them and thus resulted in a high degree of esprit de corps within the center. By using this particular method, staff members were enthusiastic about their projects and tended to have a sense of loyalty to the center.

Other directors used the participation in governance technique, where all research projects were discussed and approved by the total staff of the center before they were undertaken. Directors using this method indicated that proposals submitted by staff members, personnel outside the center and even proposals from funding agencies were thoroughly discussed by the center staff before a decision was made to pursue a particular task. Through this method, the academic freedom of the staff is insured and the center is able to enjoy a fair degree of autonomy.

It appears that it is somewhat easier for center directors to

accommodate the wishes of their own staff members than to accommodate the interests of academic departments and funding agencies. Academic departments on occasion request centers to perform certain research tasks or request research funds for their faculty members. Some directors indicated that they often found themselves in the awkward position of turning down such requests due either to a lack of funds or a conflict over the mission and purpose of the center. However, to avoid these situations, a majority of the center directors indicated that they made an overt effort to accommodate the wishes of academic departments and colleges by funding research of many faculty. This device, which might be called "sharing the wealth," not only enables the center to head off conflicts that might arise between it and various departments, but also aids the center in its total operation and helps to integrate its program within that of the university.

In some cases, center directors have little choice in whether or not to accommodate the wishes of funding agencies, for some grants are very specific and require the recipients to follow a set procedure and produce results within a given period of time. However, to avoid overly restrictive grants, center directors employ a number of devices. Some centers refuse overly specific grants and actively work for financing that will support a broad area of research. Others only seek funds for specific proposals

that originate from the center. Still other directors negotiate with funding agencies so that their needs are met without jeopardizing the purpose and mission of the center. Thus, although centers face problems in accommodating the interests and desires of their own staff, academic departments and funding agencies, the devices used to solve these dilemmas appear ultimately to aid the centers in maintaining a balance between autonomy and integration within the university community.

Rewards and Sanctions

While centers have been somewhat successful in maintaining responsibility for establishing their programs, the control of rewards and sanctions presents serious problems for both centers and academic departments. In general, it is fair to say that academic departments maintain significant control of these, primarily in the area of professorial rank and promotion. Many professionals employed in Penn State centers hold professorial rank in an academic department and receive their academic promotion through the department. A number of center directors confided that at times, they are unable to offer employment to individuals because academic departments will not or cannot give them professorial rank. One center director expressed his frustration by saying he thought the practice of an academic department controlling appointments was "utter foolishness" because individuals were employed to conduct activities for the center, and thus should be promoted via

the center. Center directors often found it very difficult to communicate to department chairmen the basis on which they believed a staff member should receive a promotion in rank. This was not only true for full-time employees but was also for departmental faculty who worked for a center on a part-time basis. Many center directors indicated they were not consulted by department chairmen at promotion time about the activities of these people, and if the directors did write recommendations, many times they were ignored. In addition, some department chairmen, according to the directors, do not seem to recognize or highly value research performed in a center as a criteria for promotion.

Certainly dual appointments do not make the department chairman's job any easier. He is asked to give an academic appointment to an individual who will spend little or no time in the chief functions of his department. This may mean giving an "outsider" rank and perhaps denying a promotion to those actually in the department on a full-time basis. Likewise, he is asked to recommend the promotion of a center staff member when he often has no knowledge of his activities. In addition, if some of his own faculty spend part of their time in a center, then they are not available to carry out certain ad hoc, day-to-day, functions in the department. Therefore, when promotion time comes, it is natural that the department

chairman will tend to look to "his own."

This dual pattern of control sometimes brings center directors and the department chairmen, as well as college deans, into conflict with one another. It also causes faculty members to have mixed and divided loyalties.

To avoid such conflict, some centers tried to hire individuals with professorial titles but no department affiliation, or appoint very few individuals with professorial rank. But in 1967, even these routes were closed when the university adopted a policy that specified that all full-time center members hired with professorial titles had to have an academic home within a department. With this in mind, it is easy to see that the centers have difficulty in maintaining their autonomy in this vital area of interest and that their problems of accommodation and accountability are quite complex.

Position In The University Structure

Where a center reports within the university structure also has an effect on its relationship with departments and colleges and is a key factor in determining its degree of integration within the university community. Universities tend to be rather loosely integrated structures. As one author has asserted, "... Quite

often a university becomes a loose collection of competing departments, schools, committees, centers, programs, largely non-communicating because of the multiplicity of specialists [sic] jargon and interests, and held together as Robert Hutchins once said, chiefly by a central heating system, or as Clark Kerr amended, by questions of what to do about the parking problem."¹¹ Thus, it was not surprising to find that Penn State centers reported at a number of levels within the university.

Of the 38 Penn State institutes and centers, 13 report to and are ultimately responsible to the Office of the Vice-President for Research.¹² Seven of these centers represent the fields of engineering, mathematics, physical science and transportation. The centers in this group are the Computation Center, Materials Research Laboratory, Ordnance Research Laboratory, Air Environment Studies group, Coal Research Section, Institute for Research on Land and Water Resources and the Pennsylvania Transportation and Traffic Safety Center. Three centers represent the health-related sciences -- the Laboratory Animal Resources Program, Research on Animal Behavior group and the Laboratory for Human Performance Research.

¹¹ Warren G. Bennis, "Post-Bureaucratic Leadership," Transaction (July/August, 1969), 48.

¹² Two other units are integrated by way of this office but were not a part of this study. They are the Health and Physics Office and the Space Science and Engineering Laboratory.

Finally, the social sciences and humanities areas are represented by the Institute for the Arts and Humanities Studies, the Institute for Research in Human Resources and the International Studies project. The centers in this group include some of the larger centers in the sample, both from a financial and staff perspective. The Materials Research Laboratory, the Ordnance Research Laboratory, the Institute for Research on Land and Water Resources, and the Laboratory for Human Performance Research represent cases in point. They receive all or a very large proportion of their finances from outside the university; and they, as well as others in this group such as the Air Environment Studies group, the laboratory for Research on Animal Behavior and the Pennsylvania Transportation and Traffic Safety Center, tend to employ faculty from many disciplines, cutting across college and departmental lines. Finally, as Dr. Eric Walker indicated, many of these centers were placed under this office as an administrative move to insure that their operations got off the ground and had the freedom and flexibility needed to perform their tasks.

The majority of units are directly responsible for their activities to various colleges. However within this pattern, there are three major variations. The usual one is that a center director is responsible directly to the dean of a particular college. However, if a director of research exists in a particular

college, center directors are often directly responsible to this person. Finally, if an experiment station exists within a college, such as the Pennsylvania Agricultural Experiment Station in the College of Agriculture or the experiment station in the College of Earth and Mineral Sciences, center directors within these colleges will report to the directors of these stations.

The remaining centers display a wide variety of integration patterns. For example, the director of the Center for the Study of Higher Education reported to the provost of the university and now reports to the vice-president for academic affairs. In contrast, the Regional Pasture Research Laboratory is very loosely integrated into the university structure. This unit is housed on land deeded over by the university to a federal agency. The director of this center reports directly to a bureau chief in Washington and has no reporting functions within the university structure. At the other extreme are a number of institutes and centers that are indistinguishable, in the final analysis, from the academic department in which they are found. In some cases, the department chairman is also the director of the institute or center. However, there are other centers that are very loosely integrated into a department or college. An example of this is one research unit that is responsible to a department chairman, but which, because it derives support from three outside funding agencies, has closer ties to these agencies both from a reporting and decision-making point of view.

This director has in effect an academic home he rarely visits.

It is difficult from this examination of centers at The Pennsylvania State University to explain what determines where centers were placed in the organizational pattern of the university. However, looking at the macrocosm, there does seem to be some relationship between the source of initiation of a center and where it resides within the university structure. Those centers initiated jointly by federal legislation and/or funds and the university administration seem to hold a fairly independent status and report to an officer in the central administration. Those institutes established by college deans or department chairmen seem to remain within that particular structure. Thus, if there is any rationale for the placement of these units within the university structure, it may be related to the history and origin of the research centers.

The position of centers within the university structure may pose problems to both the center directors and the university-wide community. Some of the center directors interviewed who headed very large and independent units complained that they enjoyed independence but at the same time were seen as threats to departments and colleges. Their positions made it difficult to attract staff from certain areas, they said. Other directors, on the other hand, who were closely tied to colleges or departments felt their activities were

restricted and thought that too often they were asked to conduct research not appropriate to the goals and functions of the center as they perceived them. The feelings of deans, department chairmen and college administrators on these matters can be found at both extremes and along the continuum between. It is important at this point to remember that most research centers and institutes that are maintained independently from departments and colleges are in this position primarily because it was believed they could not easily be placed in the departmental or college structure. However, as this study of Penn State Centers shows, 10 of the last 16 centers established report directly to departments or colleges. This may indeed be a trend for the future. At the same time, there may be reasons for establishing university-wide units such as environmental centers that would require interdisciplinary staffing, large funds, elaborate facilities and thus central administration and coordination. It does seem feasible, therefore, to have various organizational placement patterns existing on any university campus at one time.

In the way of summary then, it has been noted that Penn State centers hold various positions in the organizational pattern of the university. The larger centers are generally responsible to the Office of the Vice-President for Research. Other centers report directly through departments and colleges. Still others report through various channels and one center appears to have no

reporting function within the university at all. The organizational positions of these centers seem directly related to and correlated with their history and origin. A similar relationship does not exist between a center's placement within the university and its functions and structure. Centers of recent origin for the most part report by way of departments and colleges.

The Impact of Penn State Centers

The impact of centers and institutes is reflected by the specific achievements of these units, and these achievements, in a variety of areas and over a large cross section of problems, are impressive. The research conducted by these centers has added to the research posture of the university and the services provided by them have been beneficial not only to the university community, but to the community at large. It would be impossible to list all the achievements of the centers within this sample, thus the following list consists of selective contributions.

Agriculture

In the spirit of the Land Grant tradition, Penn State has established a number of centers to deal with the many agricultural problems facing the Commonwealth of Pennsylvania and the eastern region of the United States.

The Pennsylvania Agricultural Experiment Station over its long history has been responsible for raising the total level of

livestock and crop production in Pennsylvania. Although this station has produced a great deal of highly significant research, it has in recent times gained national prominence by finding a method to reduce the effect of a very serious blight affecting the corn yield not only in the commonwealth, but also in other eastern states. At the present time, the station is supporting many genetic research projects, which may have far reaching applications to many contemporary agricultural problems.

Similar to the efforts of the Agricultural Experiment Station, the Regional Pasture Research Laboratory has been responsible for preserving forage lands in the eastern part of the nation, and its research has brought about a high level of yield from these lands. The Herbarium has collected, identified, and cataloged thousands of plant species that exist or have existed in the commonwealth, and this laboratory serves as a source of information for plant biologists throughout Pennsylvania. Additionally, the whole livestock production industry has benefited from the research conducted by the Dairy Breeding Research Center. Among other significant contributions, this center has been able to significantly increase the fertility of cattle inseminated artificially, and has been able to increase the efficiency of both milk and meat production by greatly extending the breeding usefulness of bulls of outstanding genetic merit. Currently, various

methods of contraception in cattle are being investigated with the hope that the results may be applicable to human population control.

Environmental Studies

A number of the centers within this sample have completed or are engaged in research projects that directly or indirectly deal with many environmental problems.

The Earth and Mineral Sciences Experiment Station in the College of Earth and Mineral Sciences coordinates the efforts of four research centers, two of which are part of this study. The centers not included in this study are the Mine Drainage Research Section and the Ore Deposits Research Section. These centers are engaged in research beneficial to identifying and preserving the mineral resources of the commonwealth.

The Mineral Conservation Section, which was a part of this investigation, has been involved for an extended period of time in conducting research on where mineral resources are to be found in the commonwealth. This section has been able to develop chemical methods that discriminate between those resources formed in marine and continental beds. For example, it has been able to show that coal with a high sulfur content was developed in marine areas. This particular discovery is important not only to the coal industry, but if the knowledge is applied, it will enable the commonwealth to cut down on the air pollution caused by use of this

type of coal. In addition, the water resources group in this section is concerned with locating pure water supplies in the ground and with protecting the ground water supply from contamination and pollution. The Coal Research Section has supported research that has enabled the coal industry to find new sources and uses of coal.

Two centers in this sample are conducting research that relates to maintaining the delicate balance between animal and human life. The Pennsylvania Cooperative Wildlife Research Unit has been involved for a number of years in studying the habits, life cycles, and migration patterns of the wildlife in this region. This unit has gained national recognition for its very extensive research on deer, and it also has conducted extensive research on the wild turkey. The Pennsylvania Cooperative Fishery Unit is a comparatively new center, conducting extensive research on marine life in the area of aquatic ecology.

Two centers in the sample deeply involved in environmental problems are the Water Resources Center in the Institute for Research on Land and Water Resources and Air Environment Studies. The Water Resources Center received a commendation from the President of the United State for its development of a process to neutralize acid mine drainage and for its development of spray disposal for sewage effluent. Air Environment Studies is conducting a number of research projects in this vital area and is

training many individuals to tackle the problems of the future.

Still other centers are concerned with solving some of the problems of mass transportation systems. The Institute of Public Safety established the first driver education course in the nation. Today, in addition to continuing this program, this center trains drivers of truck fleets throughout the nation. Not only through training programs but through continuing research, this institute has contributed significantly to the highway safety of the nation. Similarly, the Pennsylvania Transportation and Traffic Safety Center is conducting a number of research projects that will ultimately make roads and cars safer. In addition, this center is engaged in a number of projects that may result in the better use of the present highway systems in the commonwealth and may lead to better transportation planning for the future.

Science and Technology

Many Penn State centers have made unique and important contributions to the fields of science and technology. Three centers are examining the various aspects of human or animal behavior. Although the Institute for Human Development is still in the beginning stages, it will concentrate on stimulating and facilitating bio-behavioral research in the area of human developmental problems. The center for Research on Animal Behavior conducts basic research, and presently has a program to investigate correlatives between

nervous systems of animals and their behavior. The Laboratory for Human Performance Research has not only developed training procedures for U.S. Olympic athletes, but also has contributed to knowledge about heart disease by conducting research on the physical reactions of obese individuals.

The contributions of the three following centers have greatly increased man's knowledge of the earth and the universe. The Field Emission Microscopy Laboratory and its director, Dr. E. W. Mueller, have made two outstanding contributions. Dr. Mueller and his associates were the first to develop a microscope capable of making atoms visible to the human eye, and more recently, this same laboratory developed an instrument that allows man to probe and manipulate individual atoms in metals. The Radio Astronomy Observatory has developed a system of employing radio wave lengths to observe the sun. The Materials Research Laboratory has made numerous contributions to this field and is recognized as a national leader in research on the development and use of materials.

Other centers have been involved in various projects, which have had a significant impact on the defense capabilities of the nation. During World War II, the Petroleum Refining Laboratory developed low temperature oils that made it possible for U. S. planes to fly at high altitudes. The Ordnance Research Laboratory has developed a number of detection and hydrolic guidance systems for American naval vessels.

Public Affairs and Public Service

The programs of many Penn State centers have directly aided the commonwealth in solving a number of problems. Although the centers within this category are engaged in a variety of research projects, they are placed under this heading because of their significant contributions in the public domain.

The Institute of Public Administration has conducted several projects for the commonwealth including the development and implementation of a Planning Programming Budgeting System, which restructured Pennsylvania's decision-making process; the establishment of a computerized inventory of state administrative, professional, and technical personnel; and the operation of the state's Executive Development Program for training high-level administrators. The Center for Research publishes a monthly newsletter on the state of the economy of the commonwealth. The Institute for Research in Human Resources has developed an experimental education program for young men in prison. The Center for Law Enforcement and Corrections offers an extensive training program for full-time employees in all areas of criminal justice within the commonwealth. This program is aimed at providing all correctional personnel with a knowledge and understanding of the total field of criminal justice.

Finally, the Shelter Research and Study Program has developed various ways of constructing fallout shelters and advises architects

and designers throughout the commonwealth. In addition, this center maintains a shelter library of national repute.

Education

A number of centers at Penn State are engaged in a variety of research projects affecting almost every level of education. Among its numerous accomplishments, the Computer-Assisted Instruction Laboratory has trained 400 elementary teachers in the Appalachia region to use new curriculum materials. The Center for Cooperative Research with Schools in conjunction with high schools throughout the commonwealth is in the process of developing curricula. The Center for the Study of Higher Education through its various research projects hopes to benefit the many public as well as private institutions of higher education throughout the commonwealth. The Student Affairs Research Program has been responsible for developing a widely used personality inventory. At the present time, this unit is in the process of developing models to explore the adjustment of students to the college environment.

Arts

The centers in this category have benefited and strengthened various academic programs in the arts and humanities. The Institute for the Arts and Humanistic Studies sponsors a program whereby eminent scholars and artists are brought to campus to conduct research,

work in their creative fields and teach. It also sponsors team research projects within the colleges, supports the research and creative work of distinguished professors in arts and humanities who are named Fellows of the Institute, and supports academic quality on the assistant professor level via competitive three-year junior fellowships that entitles the holder to institute support. The Center for the Study of Renaissance and Baroque Art has also attracted a number of visiting experts in this field to Penn State and in addition sponsors a yearly study program abroad for students in this department. The Electronic Music Research program, although in its infancy, is conducting a number of interesting experiments in the area of pitch training.

Services

In addition to those centers engaged primarily in research, a number of Penn State centers provide a variety of services to both the research and instructional programs of the university.

The Mineral Constitution Laboratory services departments within the College of Earth and Mineral Sciences by making equipment and specialized personnel available for research purposes. These services are also available to all other university departments and to industrial companies and individuals desiring to use them. This laboratory has also developed a number of new research

techniques. The Nuclear Reactor Facility provides service to researchers in the Nuclear Engineering Department and to all other departments in the university that may require its use. Similarly, the Computation Center offers its services to the entire university community. Finally, the Laboratory Animal Resources Program provides a variety of services to any individual within the university experimenting with laboratory animals. The program gives instruction on the care and handling of animals, provides consultation for the planning of animal housing and the selection of biological models, coordinates the use of equipment and provides a central pool of animal caretakers, animals and equipment. In addition, the program is responsible for surveillance to insure that the university complies with all federal and state regulation standards for research animals and provides veterinary care for prevention and treatment of research animal diseases.

These, very briefly stated are a few of the many achievements of Penn State centers. They provide one indication of the impact of centers not only upon the university but in turn upon society. In an effort to ascertain what further impact centers and institutes have upon the university, center directors were asked whether or not they believed that centers would change the structure and functioning of the university. Each center director interviewed believed that centers had already had great impact on both these

areas. As one center director summarized, "We have changed the structure because we are here." A majority of center directors believed that they have enhanced the research and service functions of the university in a manner not attainable through the present departmental structure. The center directors explained that the university would never have achieved its level of prominence in research if it were not for centers and institutes. They believe that it was through the establishment of such centers that the university was able to conduct research into vital areas that not only benefited society but in addition strengthened the total academic program of the university. Center directors placed heavy emphasis on the fact that centers performed functions that departments could or would not undertake.

Some Trends and A Look to the Future

The examination of Penn State centers and institutes has raised questions with which the university may need to deal in the decade ahead. Will new centers and institutes be added? Will centers begin to assume functions now considered the prerogative of academic departments? Can organizational insights gained from the operation of institutes and centers be transferred to the university at large? To what extent will academic departments continue to control rewards of center staff members? Will centers continue

to report at various levels within the university structure or will there be some administrative restructuring? Although this study does not provide any conclusive answers to these questions, a number of trends are apparent and they may be helpful as guideposts for future decision making.

At least four factors may lead to the future growth of centers and institutes: 1) the availability of continued federal, state or other monies; 2) the continuation of the demand for task-oriented and multidisciplinary research; 3) the ability of academic departments, college deans, or faculty entrepreneurs to "sell" decision makers on the need for additional centers; and 4) the favorable attitude of key decision makers toward centers and institutes.

There is general agreement that federal, state and other financial allocations will be much more difficult to obtain in most areas for a number of years to come. Many directors in this sample have experienced a reduction in outside funding and many anticipated further reductions. In some cases, the university has begun to pick up the slack by granting more money to centers, but other centers were planning to cut down on their staff and activities. However, there are two notable exceptions to this reduction in outside funding and these are in the areas of environmental problems and public health. In these areas, monies are expected to increase. Thus, centers now concerned with research in these two areas may

be expected to increase their activities and indeed new centers may well be established. In general, however, it seems apparent from the views expressed by center directors that the addition of a large number of centers will not occur at Penn State within the next decade if their initiation is dependent on large amounts of outside funding.

As indicated earlier in this report, the primary mission of the majority of centers is task-oriented research. There seems no reason to believe that the demand for this type of research will decline. Indeed, emphasis on problems of the environment and on other social-technological issues suggests that this type of research will continue and is likely to expand. There is also a related and growing tendency to call on the expertise of a number of disciplines to address many of today's research problems. Thus, since the task-oriented, multidisciplinary approach to problems appears to be on the increase, there seems good reason to believe that centers will continue to share these functions within the university.

In the past 10 years, it appears that the central administration has been receptive to the supportive of proposals from individuals, departments and colleges desiring to establish centers. Whether this trend will continue will depend not only upon the persuasiveness of departments and colleges and their ability to attract outside

funding, but also on the attitude of the central administration toward the further expansion of centers and institutes. In the past, proposals for the establishment of centers have been handled on a one-to-one basis. If a proposal was apparently sound and the need reasonably well-justified, a unit was brought into existence. There was purposely no overall university policy for the establishment of centers and institutes, and there may be indeed no need for such a policy. However, whether or not centers and institutes will be added in the future in the final analysis may depend more on a master plan and a set of long-range goals developed by the university. It would seem that any long-range plan developed should seriously consider the role of centers in the overall university program.

This leads to a consideration of functions performed by centers and institutes. The rationale given for the development of centers and institutes has centered on the premise that they could perform certain tasks that the academic department, with its present structure, could accomodate less well. Will centers begin to assume further departmental functions, or will departments begin to co-opt centers and institutes? There are a variety of opinions with regard to both these questions. Some educators believe the centers will expand their functions to include the education of graduate students and will ultimately be responsible

for all graduate education. However, the majority point of view is that the centers at Penn State will continue to exist and grow but essentially along present lines.

There is the opposite feeling among some members of the university community that departments and colleges may begin to take over functions now performed by centers. The main reason given for this position is the recent growth of academic departments to the extent that they are now in a position to assume these functions and therefore separate structures are no longer needed or in the best interest of the overall university program. Some center directors believe, however, that if they become closely integrated with academic departments their functions would not be given a high priority status.

The general trend at Penn State seems to be that centers will remain single-purpose units, and with perhaps a few exceptions, these units will remain fairly autonomous and will not be co-opted into the departmental structure. However, the ultimate fate of centers will finally rest on key policy decisions.

As indicated earlier in this discussion, the very existence of centers and institutes has made both overt and subtle changes on the functions and structure of the university. It is possible that the university as a whole can gain some organizational insights from centers and institutes. Centers and institutes tend to be more flexible than the departmental structure and this lack

of rigidity, a greater willingness to change, and increased openness to new ideas and proposals is a posture that may be adopted increasingly by other segments of the university community. As noted earlier, the most prominent organizational structure in this sample of centers was the so-called truncated bureaucracy. This model or one closely resembling it might be examined as an alternative to present organizational practice that would enable the organization to establish greater resource flexibility.

The findings suggest two areas may cause some anxiety for center directors and may be somewhat disturbing to deans and department chairmen. These concerns focus on the control over academic rewards and the related issue of position of centers within the university structure. The central question over the control of academic rewards is whether institutes and centers shall have authority to control rewards and sanctions for their professional personnel in the professorial ranks, such as appointments, salary increases, and promotion, or whether this authority must be shared with and rest largely in the hands of the academic department. An issue with regard to the position of centers within the university organizational structure focuses on whether or not centers report at an optimum level. Related to both of these issues is a desire on the part of some center

directors to have some more explicit guidelines prepared dealing with these issues. Although a policy on the award of professorial titles for center personnel presently exists, there seems to be less-than-full understanding of the policy and apparent unequal application of it. Again, some center directors indicated that it would be helpful to them if their positions within the university structure were clarified.

Finally, as stressed earlier, the future of Penn State's centers should ultimately rest on the objectives and goals of the university and the organizational structures adopted to carry these out. The observations of Kruytbosch and Messinger suggest such a relationship between university goals and organizational structure:

As a result of two and a half decades of boom and solutions of problems by expansion, many changes have taken place in major universities -- but universities are only beginning to explore the possibilities of a more rational management of research and graduate education. Many problems stem from this fact. The university continues to attempt to fit greatly expanded research and graduate education functions into administrative and organizational forms designed for an undergraduate teaching institution. The situation has forced definitional contractions and semi-legitimate practices upon researchers and research administrators, among others, thus contributing to cynicism about university governance. Open discussion of the problems has been inhibited, partly by the danger of exposing the inconsistencies and semi-legitimacies and the risk of endangering funding, and partly because of the lack of systematic information about the nature of the research enterprise, and its intimate involvement in graduate education.¹³

¹³Carlos E. Kruytbosch and Sheldon L. Messinger, "Unequal Peers: The Situation of Researchers at Berkeley," The American Behavioral Scientist (May-June, 1968), 40-41.

Thus, the ultimate issue is one of university goals and values and the appropriate translation of these concerns in the form and function of the university.

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